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A minimally invasive approach with a 3d imaging system for the treatment of esophageal perforation due to Boerhaave syndrome

Boerhaave's syndrome is a rare life-threatening condition that requires urgent surgical management. There are various methods of managing it, with the main principles of limiting sepsis, draining the area and maintaining nutrition. Although the gold standard is open thoracotomy and/or laparotomy, mostly in patients with sepsis, we present a case of a 53-year-old man treated with a combination of laparoscopic suture (3D imaging system) of the oesophageal perforation site, decompressive percutaneous endoscopic gastrostomy and feeding jejunostomy. We conclude that this approach is a safe and a viable option in the management of Boerhaave syndrome in a septic patient presenting early.

KEY WORDS: Boerhaave's syndrome, Laparoscopy, Minimally invasive surgery, Oesophageal Rupture, Surgery, 3D-laparoscopy

Introduction

Boerhaave's syndrome is an emergency, life-threatening condition in which all layers of the esophageal wall are perforated due to a sharp increase in the esophageal pressure. Firstly described by the Dutch physician Hermann Boerhaave in 1724, this syndrome is characterized by difficulties in diagnosis because of the not specificity of the symptoms and it is associated with a high mortality and morbidity if not detected and treated promptly. Prompt recognition and initiation of treatment, in fact, is considered essential for a favourable outcome and, for this reason, the "golden time period" for successful therapy is within the first 24 hours [1]. The main principles of the managing of such condition include limiting the sepsis, draining the area and maintaining the nutrition. Even if the gold standard treatment include open thoracotomy associated to laparotomy we intend to report a case of a patient treated with a laparoscopic approach with a 3D imaging system.

Case Report

A 53-year-old man was referred to our emergency department for acute abdominal pain after vomiting. Physical examination revealed a mild epigastric tenderness. His blood pressure was 115/70 mmHg, the pulse rate 84 beats per minute, the electrocardiogram showed sinus tachycardia and cardiac enzymes were within the normal range. Other blood investigation showed a leucocytosis ($15{,}5 \times 10^9$/L), Procalcitonin 11,2 ng/mL and arterial blood gases on room air showed a mild metabolic acidosis with a base excess of 3.8 and an oxygen saturation of 94%. Moreover the patient complained respiratory tachypnea. A thoraco-abdominal CT scan was performed and showed a distension of the distal esophagus with a thickened and oedematous wall associated to a left hydropneumothorax and to a posterior pneumomediastinum (Figs. 1A, B). A swallow study with water-soluble contrast was performed showing a leakage in the

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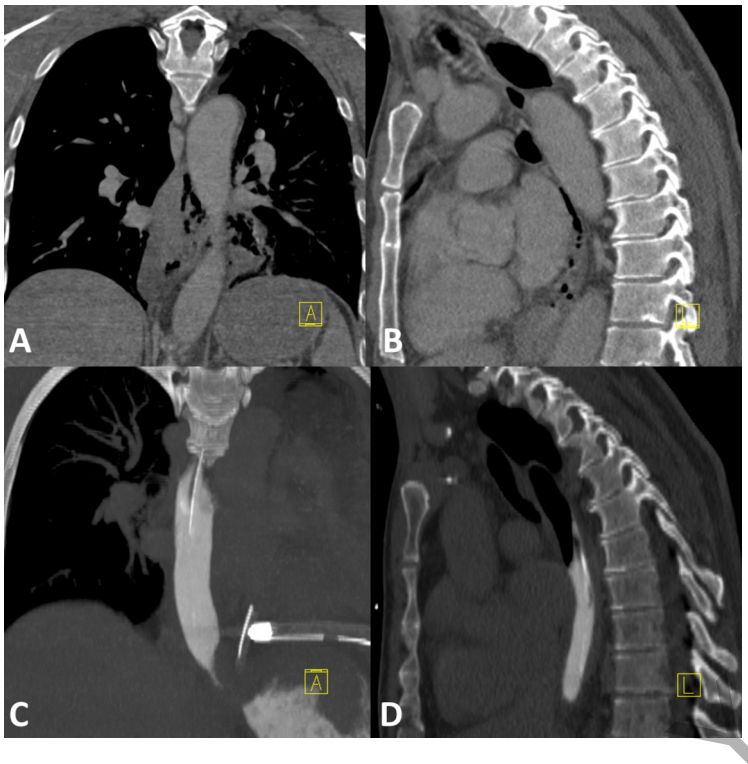

Fig. 1: CT scan showed a distension of the distal esophagus with a thickened and oedematous wall associated to a left hydropneumothorax and to a posterior pneumo-mediastinum (A-B). Swallow study with water-soluble contrast showed a leakage in the distal oesophagus (C-D).

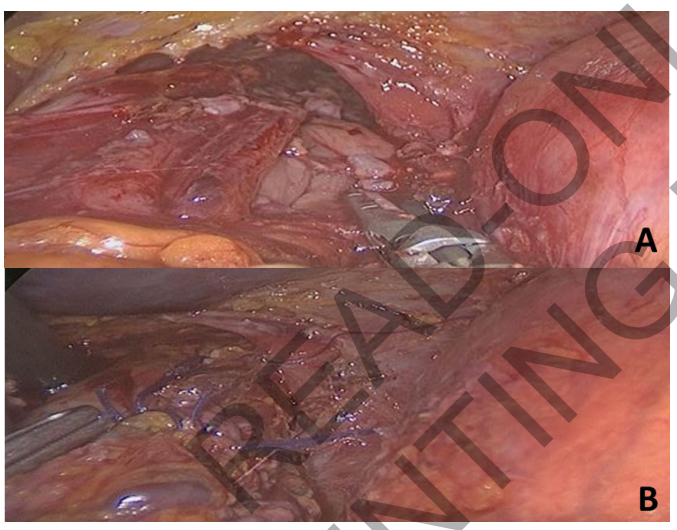

Fig. 2: Intraoperative laparoscopic view of the oesophageal perforation (A) and the suture of the perforation site with Vicryl stiches (B).

Fig. 3: The abdominal scars of the patient at 1-year follow-up.

distal oesophagus, confirming our suspicions (Figs. 1 C, D). After the insertion of a left-sided chest tube, the patient was transferred to the operatory room for an emergency exploratory laparoscopy. For this operation we used a 3D imaging system in order to enhance depth perception and facilitate operation. In the operating theatre, after the first laparoscopic entry in the abdomen according to the open Hasson technique, an exploratory laparoscopy was performed. We exposed the cardioesophageal junction till above the hiatus, and dissected the left diaphragmatic crus and the angle of His in order to isolate the oesophagus up to the mediastinum until the distal oesophageal perforation site was identified on the left side. A laparoscopic suture of the perforation site with Vicryl stiches was performed and, in order to test the suture, an endoscopic control combined with a pneumatic testing was performed that resulted negative for any leakage (Figs. 2 A, B). Moreover, an abdominal Blake drain tube reaching the mediastinum through the oesophageal jatus was positioned. In order to detrain the stomach we performed an endoscopic decompressive percutaneous endoscopic gastrostomy (PEG) and, in order

to provide a rapid re-feeding of the patient we performed a feeding jejunostomy. After the surgical operation the patient was transferred in the intensive care unit for a postoperatively monitoring and subsequently transferred to the general surgery ward after 24 hours. The abdominal drain was removed on the 5th postoperative day (after the execution of a Thoraco-abdominal CT scan of control) and the thoracic drainage was removed on the 10th postoperative day. The patient was discharged in the 21st post-operative day with a semi-liquid diet up to surgical re-evaluation in our outpatient clinic, moreover, the PEG and jejunostomy were removed after 1 month in our outpatient clinic and at 1-year follow-up, the patient is in excellent condition (Fig. 3).

Discussion

Despite considerable improvements in diagnostic tools and therapeutic techniques, oesophageal perforation still remains a life-threatening condition and is associated with high morbidity and mortality rates, ranging from 10 to 50% [2]. The diagnosis of such condition can be difficult because, often, symptoms can masquerade many other clinical conditions like gastric ulcer and perforation, pancreatitis or spontaneous pneumothorax. The prompt recognition of this potentially lethal condition, in fact, is diriment to ensure appropriate treatment. In order to confirm the clinical suspicion and to make diagnosis, CT scan is mandatory, associated to an upper GI swallow test in order to evaluate the site and the extension of oesophageal rupture [3]. Even if conservative management and the use of covered self-expanding stents has been proposed, surgical intervention could be considered the therapy of choice, especially for cases with an early diagnosis. There have been several reports of the minimally invasive surgical management of spontaneous oesophageal rupture via either laparoscopy or thoracoscopy or both [1,3-7]. Avoidance of thoracotomy or laparotomy may results in considerable benefit for critically ill patients, even if open repair and drainage are still the gold standard treatments for this condition. According to Connelly et al. the surgical management with direct repair is associated with good survival while a delayed time to theatre is associated with an increased mortality [8]. In this patient, with signs of sepsis and in absence of significant medical risk factors or contraindication to the laparoscopic approach and in presence of a stable haemodynamic, a laparoscopic approach was successfully performed. Moreover, three-dimensional (3D) imaging, a recent technical innovation in laparoscopic surgery, has been postulated to enhance depth perception and facilitate operations, mostly in small spaces. In a recent study [9], in fact, authors conclude that laparoscopic 3D offer a more realistic standard and closer to "open surgery" vision and that the experimental setting reported better performances in terms of speed and accuracy with 3D vision, both in the expert and in the novice surgeons. This case thereby proves the efficacy of the abdominal laparoscopic approach for patients with an oesophageal perforation due to Boerhaave syndrome and proves this treatment is feasible and successful when early diagnosis is made and surgery instituted. Moreover, a 3D imaging system for this type of laparoscopic repair can enhance depth perception facilitating the operation.

Riassunto

La Sindrome di Boerhaave è una patologia di raro riscontro nella pratica clinica che si caratterizza per la perforazione a tutto spessore della parete esofagea, legata ad un repentino incremento della pressione endoluminale. Questa condizione, la cui diagnosi è resa difficile dalla aspecificità del corteo sintomatologico, necessita di intervento chirurgico urgente, in quanto estremamente rischiosa per la vita; la clinica spesso mima quella di altre condizioni patologiche come l'ulcera peptica, la perforazione gastrica, la pancreatite o lo pneumotorace spontaneo, ma il riconoscimento precoce del quadro è fondamentale per garantire un trattamento adeguato il più rapidamente possibile. Vari sono i possibili approcci nella gestione di questa condizione, ma i capisaldi della terapia sono rappresentati dal controllo della sepsi, il drenaggio efficace della regione interessata e l'adeguato supporto nutrizionale. Sebbene il gold standard per il trattamento sia rappresentato dall'approccio toracotomico e/o laparotomico aperto, presentiamo qui il caso di un paziente di 53 anni, giunto alla nostra osservazione per un quadro di dolore addominale insorto acutamente dopo un episodio di vomito protratto, cui è stata prontamente diagnosticata una perforazione esofagea che è stata tempestivamente trattata con un approccio combinato: sutura laparoscopica con sistema di ottica 3D della perforazione esofagea, posizionamento di una gastrostomia decompressiva per via endoscopica e confezionamento di una digiunostomia per fini nutrizionali. Evitare una toracotomia o una laparotomia ad un paziente in stato settico che si trovi in condizioni critiche fornisce vantaggi evidenti; dal momento che il nostro paziente non presentava fattori di rischio significativi o controindicazioni alla laparoscopia e visto che si trovava in condizioni emodinamicamente stabili, è stato possibile trattarlo con tecnica mininvasiva. Inoltre, l'ausilio della visione tridimensionale, recentemente introdotta in chirurgia laparoscopica, ha garantito una migliore percezione della dimensione della profondità, facilitando l'intervento in uno spazio così ridotto come quello mediastinico. Questo caso prova l'efficacia e la sicurezza dell'approccio laparoscopico nel trattamento di una perforazione esofagea dovuta a Sindrome di Boerhaave, in un paziente in condizioni settiche iniziali, allorché la diagnosi sia precoce e l'intervento chirurgico venga eseguito tempestivamente.

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